

“Getting more from your research data”

An Overview of the UITS/RT Data, Analytics, and Visualization Workshop Series

Eric Wernert
UITS Research Technologies
Jan 30, 2018



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Goals of these workshops

1. Increase awareness of RT groups and services that support research
2. Provide a rich set of examples of how services are being used
 - Conceptual understanding of methods and technologies
 - General idea of workflow and effort involved
3. Learn how to find more information or contact experts for follow-up consultation and/or training

Workshops are open to all. This series was designed for students/faculty/staff in social and physical sciences.



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Data, Analytics, & Vis Workshop Schedule

Spring 2018 – Tuesdays @ noon - SSRC

Date	Topic	Presenter(s)
Jan 30	Getting more from your Research Data	Eric Wernert, Scott Michael, Esen Tuna, Mike Boyles
Feb 6	Your Statistical Toolbelt	Stephanie Dickinson (IU School of Public Health)
Feb 13	Intro to R for Analysis	Jefferson Davis, Scott Michael
Feb 20	Databases, Enclaves, and Repositories for Research	Esen Tuna, Alan Walsh
Feb 27	Analysis with MATLAB	Jefferson Davis, Scott Michael
Mar 6	Intro to Scientific Visualization with Paraview	Bill Sherman, Mike Boyles
Mar 13	(Spring Break)	
Mar 20	Creating Computational Interfaces	Scott Michael, Tassie Gniady
Mar 27	Structural Equation Modeling	Justin Wild
Apr 3	GIS Software & Data Sources for Research	Justin Peters
Apr 10	Intro to Information Visualization	Jefferson Davis, David Reagan

Tony Walker, Sr. Technical Advisor

George Turner, Chief Systems Architect

Systems
vacancy, Director

High Performance File Systems
Stephen Simms, Manager

Thomas Crowe	Nathan Lavender
Chris Hanna	Ken Rawlings
Nathan Heald	Shawn Slavin

High Throughput Computing
Robert Quick, Manager

Alain Deximo	Chris Pipes
Kyle Gross	Elizabeth Prout
Marina Krenz	Sarah Schmiechen
Thomas Lee	Scott Teige

Research Storage
Charles McClary, Manager

Chris Garrison	Jeff Russ
Karl Garrison	Haichuan Yang
Stewart Howard	

Application Virtualization
Stephanie Cox, Manager

Ellyn Barham-Pruitt	Steve Schunk
Sean Mahoney	

Visualization and Analytics
Eric Wemert, Director

Advanced Visualization Lab
Michael Boyles, Manager

Patrick Beard	David Reagan
Ed Dambik	Jeffrey Rogers
Chris Eller	William Sherman
Chauncey Frend	

Margaret Dolinsky,
Research Scientist

Research Analytics
Scott Michael, Manager

Jefferson Davis	Justin Peters
Tak Noguchi	Kevin Wilhite

Digital Humanities Cyberinfrastructure
Tassie Gniady, Coordinator

David Kloster

Research Data Services
M. Esen Tuna, Manager & Technical Advisor

Nancy Long	Guangchen Ruan
James McCombs	Alan Walsh
Dimitar Nikolov	

Science Community Tools
Robert Henschel, Director

Advanced Biom edical IT Core
Richard Meraz, Manager

Andrew Arenson	Jim Mullen
James Dudley	Radha Surya
Ryan Long	Yelena Helen Yezerets
Abhijeet Malatpure	<i>Vacancy</i>

Scientific Applications and Performance Tuning
Abhinav Thota, Manager

H.E. Cicada Dennis	Le-Mai Weakley
Ben Fulton	

Scalable Compute Archives
Arvind Gopu, Manager

Soichi Hayashi	Michael Young
Raymond Perigo	

Thomas Doak, Manager

**National Center for
Genome Analysis Support (NCAS)**

Tom Doak, Principal Investigator
Scott Daniel Michaels, Co-Principal Investigator
Craig Stewart, Co-Principal Investigator

Carrie Ganote	Sheri Sanders
Bhavya Nalagampalli	
Papudeshi	

Community Engagement and Interoperability
Therese Miller, Program Director

Jetstream Project Management and Outreach

Jeremy Fischer, Sr Technical Advisor
Sanjana Sudarshan, Sr Technical Advisor

Campus Bridging and Research Infrastructure
Joe Butler, Manager

Brian Chase	Matthew Standish
Eric Coulter	Aaron Wells
Barbara Hallock	Sarah Williams

Collaboration and Engagement Support
Winona Snapp-Childs, Manager

Julie Wernert	Robert Ping
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Vacancy, Lead Cyberinfrastructure Analyst

Advanced Cyberinfrastructure
David Y. Hancock, Program Director

High Performance Systems
Peggy Lindenlaub, Manager
Matt Allen, Senior Technical Lead

Stephen Bird	Adrian Hosey
Collin Gayde	Joseph Rinkovsky

Digital Arts & Humanities Workshops

Spring 2018 – Fridays @ noon – Wells 157H (IQ-Wall)

Date	Topic	Presenter
Jan. 12	Intro to Digital Humanities	Tassie Gniady
Jan. 19	Intro to Visualization	Michael Boyles
Jan. 26	Intro to R	Tassie Gniady
Feb. 2	Augmented Reality	Chauncey Frend
Feb. 9	Text Analysis of Kurt Vonnegut with the HathiTrust & Voyant	Tassie Gniady
Feb. 16	Virtual Reality	William Sherman
Feb. 23	R for Twitter	Tassie Gniady
Mar. 2	Advanced Media	Chris Eller
Mar. 23	Network Graphs	David Kloster
Mar. 30	3D Object Acquisition and Printing	Jeff Rogers
Apr. 6	IQ-Tables & Touch-Enabled Software Workflows	David Reagan
Apr. 13	Omeka S and 3D Collections	Tassie Gniady

Other UITS/RT Training Sessions

- Unix: The Basics
 - February 7th at IUPUI and February 9th at IUB. Both classes are 12 to 4 PM.
- Faster Work, Safer Storage (an introduction to HPC)
 - February 15th at IUB and February 16th at IUPUI. Both classes are 1 PM -5 PM.
- Supercomputing For Everyone: Introductory Parallel Programming for Supercomputers
 - April 4th at IUPUI, 9 AM - 5 PM, and April 6th at IUB, 9:30 AM - 5:30PM.
- Supercomputing For Everyone: Intermediate Parallel Programming for Supercomputers
 - April 11th at IUPUI, 9 AM - 5 PM, and April 13th at IUB, 9:30 AM - 5:30PM.



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Outline for Today

- RT Groups & services in this workshop
 - Research Analytics
 - Research Data Services
 - Advanced Visualization Lab
- Examples from upcoming workshop sessions



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Research Analytics

- Team members & expertise
 - Scott Michael – Manager, High-performance analytics & computing, Machine Learning & Deep Learning
 - Jefferson Davis – Mathematical Analysis & Machine Learning
 - Takuya Noguchi – Statistical Analysis
 - Justin Peters – Geospatial analysis & data sources
 - Kevin Wilhite – Analytics software & licensing



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Research Analytics

- Services
 - Software licensing and support
 - Statistical – SPSS, SAS, SAS/JMP, Stata, Amos, NVIVO
 - Mathematics – Mathematica, Maple
 - Multi-purpose – MATLAB (no charge), R
 - Geospatial – ESRI/ArcGIS, QGIS, GRASS
 - Consulting:
 - Analytics methods: statistical, mathematical, geospatial
 - Computational interfaces



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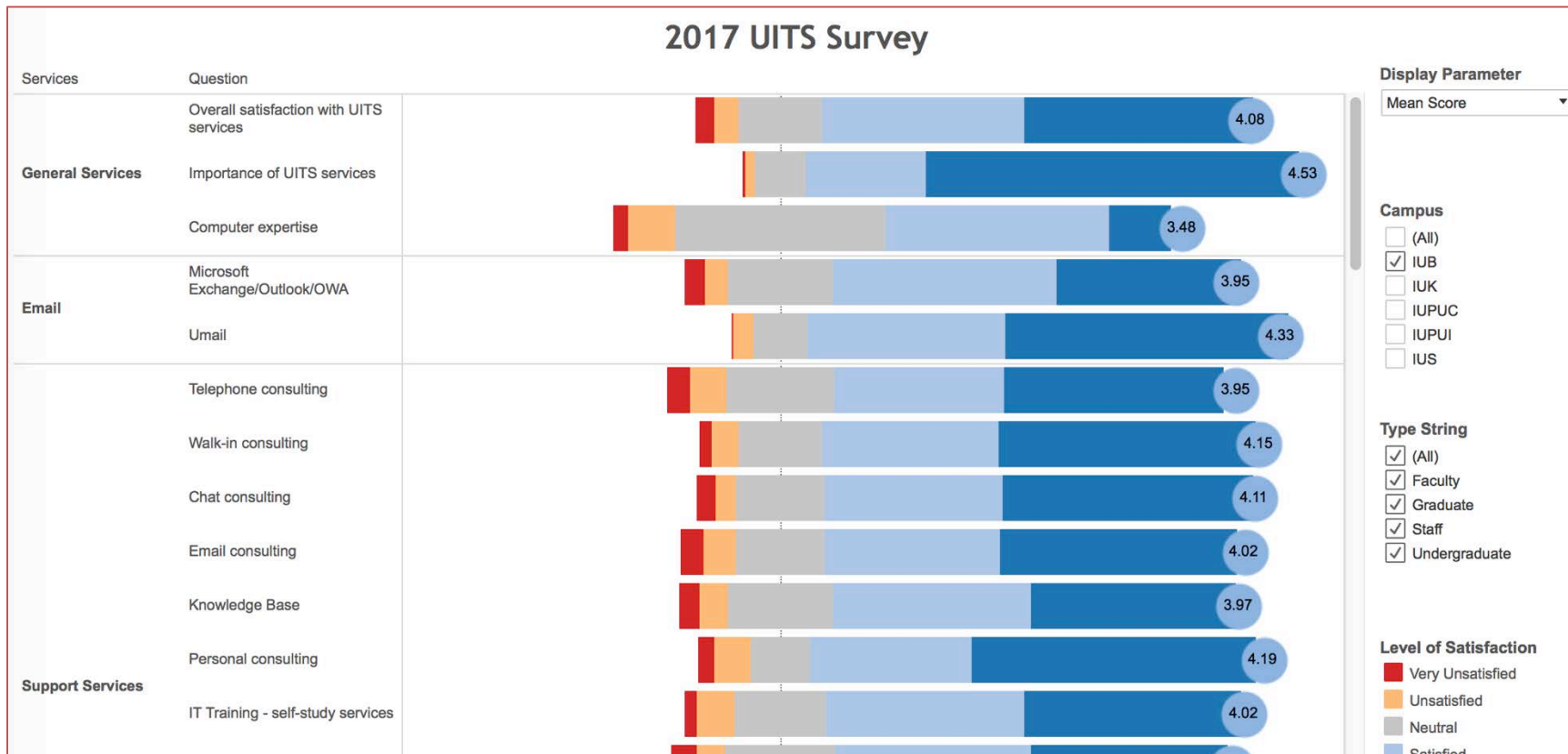
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UITS Annual Survey

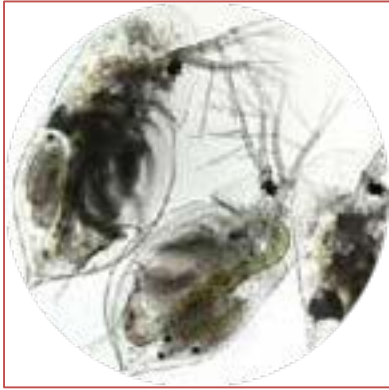
(with RT/CESG & UITS/CSS; <http://www.indiana.edu/~uitssur/>)

2017 UITS Survey



MATLAB Examples

(Workshop: Feb 27)



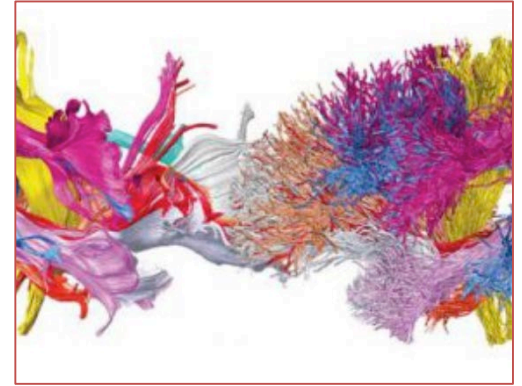
Dr. Spencer Hall,
Biology

infectious disease in food webs. Run simulations; solve systems; fit models; visualize



Dr. Shirin Hassan
School of Optometry

organize and analyze street crossing decisions of the visually impaired



Dr. Franco Pestilli,
Psych. & Brain Sciences

Study brain structure, function, and behavior

R / R Studio / Shiny Examples

(DAV Workshop: Feb 13)

Dr. Peter Miksza

Jacobs School of Music

Set of R/Shiny tools for
emerging music education
researchers

Deployed on Jetstream VM

<http://js-156-26.jetstream-cloud.org:3838/>

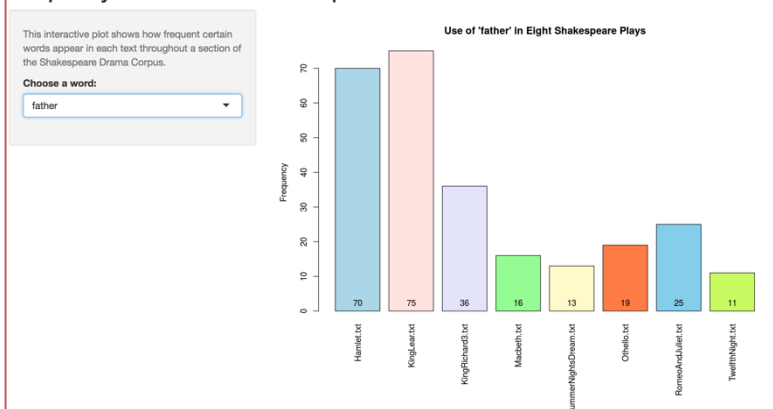


R & Shiny for Text Analysis

A&H Workshops - Feb 9 & Feb 23

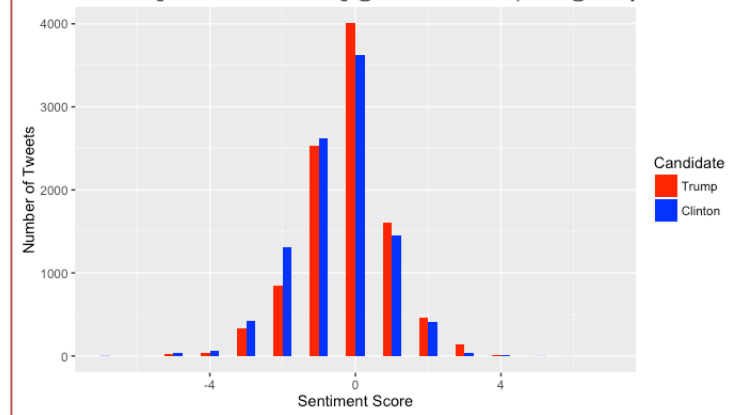
Dr. Tassie Gniady, *UITS/RT CyberDH*

Frequency of Terms Across a Corpus



Shiny app for term frequency in Shakespeare plays corpus

Sentiment Scoring of Tweets Mentioning @realDonaldTrump and @HillaryClinton



Sentiment analysis of tweets leading up to 2016 presidential election



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Computational Notebooks

(DAV Workshop: March 20)

```
In [14]: sample.result = score.sentiment(sample.pos.words, neg.words)
```

Did it work?

```
In [15]: sample.result
```

score	text
2	This ice cream is the best! I love this flavor!
-3	I am so angry at the terrible weather today. Frustrated.
3	Wow, spectacular, I wish I could be as perfect as you.

It worked! Now we can be sure our algorithm is behaving as we would expect. Lets score our Twitter data since we are confident in our function-creating abilities...

Scoring Twitter Data

Again, we have already created our function, we just need to tell it what to analyze. We will use our [candidate].text objects as the "tweets" argument and save each as an object called [candidate].result to plot a little later.

```
In [16]: clinton.result = score.sentiment(clinton.text, pos.words, neg.words)
cruz.result = score.sentiment(cruz.text, pos.words, neg.words)
sanders.result = score.sentiment(sanders.text, pos.words, neg.words)
trump.result = score.sentiment(trump.text, pos.words, neg.words)
```

Lets peek at the results to see if it is still working...

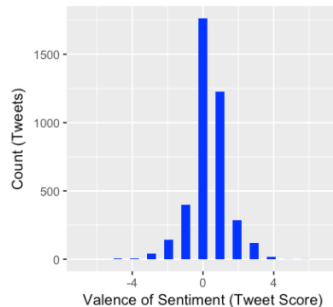
```
In [17]: tail(clinton.result)
```

	score	text
3995	1	.@HillaryClinton talks one-on-one w/ @wolfblitzer moments after finding out she won in #Iowa https://t.co/UFppUa7v3 https://t.co/3rWCziutyg
3996	1	RT @CNN: She's 102 years old, and she was at the #IowaCaucus to support @HillaryClinton https://t.co/yhvlaTbKQl https://t.co/lx2xm6fq
3997	1	RT @ChloeGMoretz: My girl won Iowa !!!!! @HillaryClinton
3998	-2	RT @UniteWomenWY: .@BernieSanders' #BernieBros Problem. His crusaders who hate on @HillaryClinton supporters https://t.co/wRsZzC2KYl
3999	0	RT @HillaryClinton: Text CONGRATS to 47246 to tell Hillary you'll be by her side for the next part of this campaign. https://t.co/FHoAPFij8
4000	0	RT @HillaryClinton: Text CONGRATS to 47246 to tell Hillary you'll be by her side for the next part of this campaign. https://t.co/FHoAPFij8

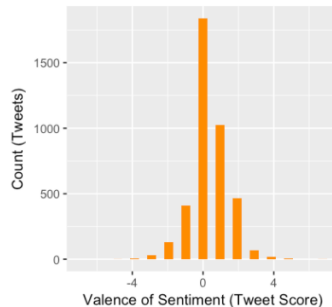
Loading required package: grid

```
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
Warning message:
"Removed 1 rows containing non-finite values (stat_bin)."
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
`stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```

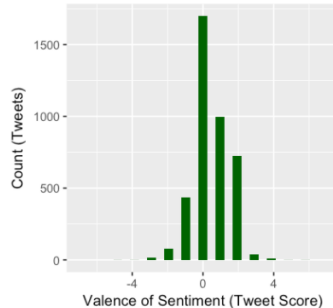
Sentiment of @HillaryClinton on Tw



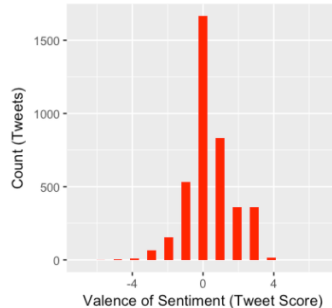
Sentiment of @realDonaldTrump on



Sentiment of @BernieSanders on T

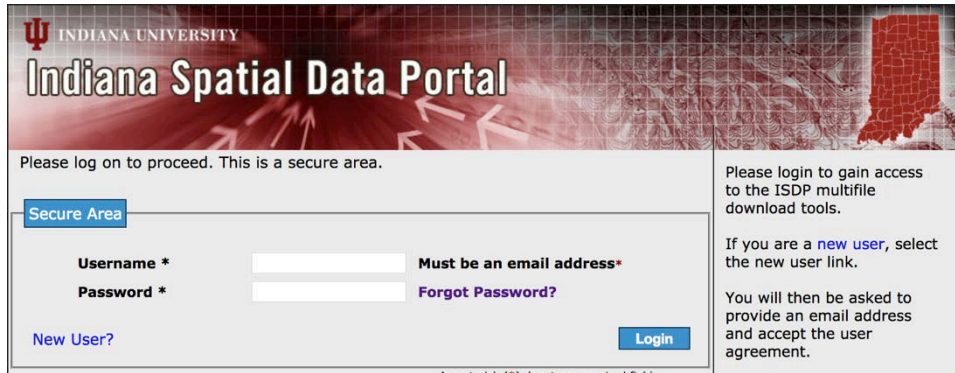


Sentiment of @tedcruz on Twitter



GIS & Indiana Spatial Data Portal

(DAV Workshop: Apr. 3)



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Indiana Spatial Data Portal

Please log on to proceed. This is a secure area.

Secure Area

Username * Must be an email address*

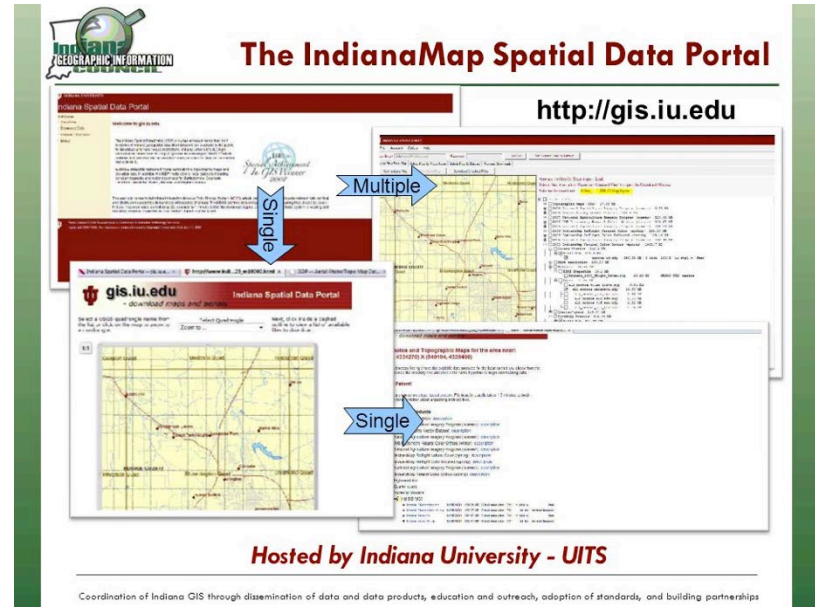
Password * Forgot Password?

[New User?](#) [Login](#)

Please login to gain access to the ISDP multifile download tools.

If you are a [new user](#), select the new user link.

You will then be asked to provide an email address and accept the user agreement.



The IndianaMap Spatial Data Portal
<http://gis.iu.edu>

Multiple

Single

Single

Hosted by Indiana University - UITS

Coordination of Indiana GIS through dissemination of data and data products, education and outreach, adoption of standards, and building partnerships



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Research Analytics

- For more information
 - researchanalytics@iu.edu
 - Search the KB for
 - “research analytics”
 - Specific software title, e.g. “SPSS”, “MATLAB”
 - Etc.



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Research Data Services

- Team members & expertise
 - Esen Tuna – Manager, Data classifications and policies, RADaRS service
 - Alan Walsh – Research Database Complex
 - Nancy Long – Research Database Complex
 - Dimitar Nikolov – Data management tools and workflows
 - Guangchen Ruan – Data intensive HPC workflows
 - James McCombs – Stampede2 & XSEDE workflows



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Research Data Services

(DAV Workshop: Feb 20)

- Services
 - Research Database Complex (RDC)
 - RADaRS
 - Data workflow consulting
 - Cloud Services for storage (esp. Box)
 - Workflows using Stampede2



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RADaRS

(Restricted Access Data Remote Server)

- Co-managed with Social Science Research Commons (SSRC)
- Secure data enclave for social sciences and beyond
- Enable data custodians to upload datasets securely
- Allow researchers to access the server remotely through VPN connection
- Restrict researchers to analysis only
 - No user-initiated data transfers in or out
 - No copy, paste, or print
 - No web access
- Provide common analysis tools by default
 - SAS, SPSS, Stata, R, Microsoft Office, etc.



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RADaRS Sample Datasets

A few of the **data vendors** that researchers are working with:

BLS	Bureau of Labor Statistics
CPC	Carolina Population Center (UNC)
FaHCSIA	Australian Dep. of Families, Housing, Community Services and Indigenous Affairs
ICPSR	Interuniversity Consortium for Political and Social Research (Univ. of Michigan)
IDOE	Indiana Department of Education
NAPHSIS	The National Association for Public Health Statistics and Information Systems
NDACAN	National Data Archive on Child Abuse and Neglect (Cornell University)
NORC	National Opinion Research Center (University of Chicago)
NYSDH	New York State Department of Health
OSHPD	California Office of Statewide Health Planning and Development



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Research Database Complex (RDC)

- Support for research-related databases
 - MySQL & Oracle (currently)
 - Postgres & Cassandra (coming soon)
- Support data-intensive applications on databases
- Provide for database-driven web applications focusing on research



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RDC Users

RDC Client		
21st Century Scholar Program	Department of Medical and Molecular Genetics, IUSM	Kinsey Institute
Advanced Biomedical IT Core, UITs	Department of Otolaryngology, IUSM	Komen Tissue Bank, IUSM
Center for Genomics and Bioinformatics	Department of Pediatrics, IUSM	Learning Technologies, UITs
College of Arts & Sciences, Cognitive Science Program	Department of Physics	Molecular and Cellular Biochemistry Dept., Biotechnology Prog.
College of Arts & Sciences, Dean's Office	Department of Political Science	Pervasive Technology Institute (PTI), UITs
Computer and Information Technology	Division of General Internal Medicine and Geriatrics, IUSM	Regenstrief Institute, IUSM
Computer Information Systems Department	Health Information & Translational Sciences (HITS), IUSM	School of Education
Department of Biology – IUB	Hutton Honors College	School of Engineering and Technology
Department of Biology – IUN	IU Affiliates	School of Informatics and Computing (SoIC) – IUB
Department of Biostatistics, IUSM	IU Alumni Association	School of Informatics and Computing (SoIC) - IUPUI
Department of Geological Sciences	IU Bloomington Libraries	School of Liberal Arts
Department of History and Philosophy of Science and Medicine	IUB-VPGA	School of Medicine, IUSM
Department of Information and Library Science	Jacobs School of Music	School of Public and Environmental Affairs (SPEA)
Dept. of Instructional Systems Tech. (IST), School of Education	Jewish Studies Program	University Student Services and Systems
Department of Kinesiology, SPH	Kelley School Of Business	Vice President of Information Technology
Department of Linguistics	Kelley School Of Business (IUPUI)	



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RDC by the numbers

RDC (FY2015/2016)	Oracle	MySQL	Total
# of Database Instances	17	103	120
# of Schemas	310	414	724
# of User Logins	10,214,307	2,639,579	12,853,886
Storage - Allocated (TB)	16	6	96
Storage - Used (TB)	7	5	12
Database Growth (% of disk used)	5.7	81.2	-
Largest DB - Instance size (TB)	2.8	2.6	-
Average DB Size (GB)	472	51	-
Median DB Size (GB)	243	0.23	-
Backup Utilization - Disk (TB)	13.0	1.7	-
Backup Utilization - SDA (TB)	25.1	7.1	-



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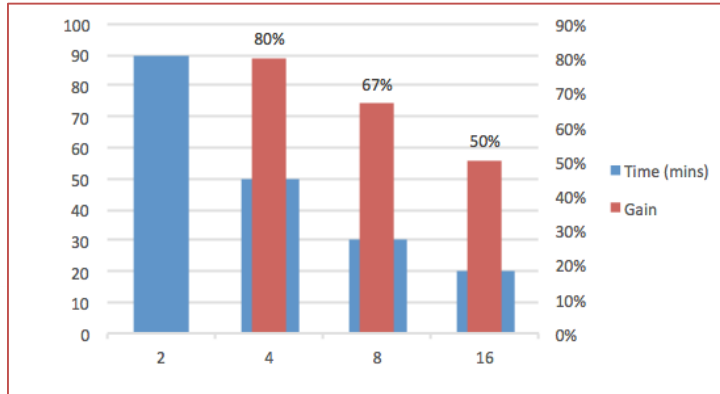
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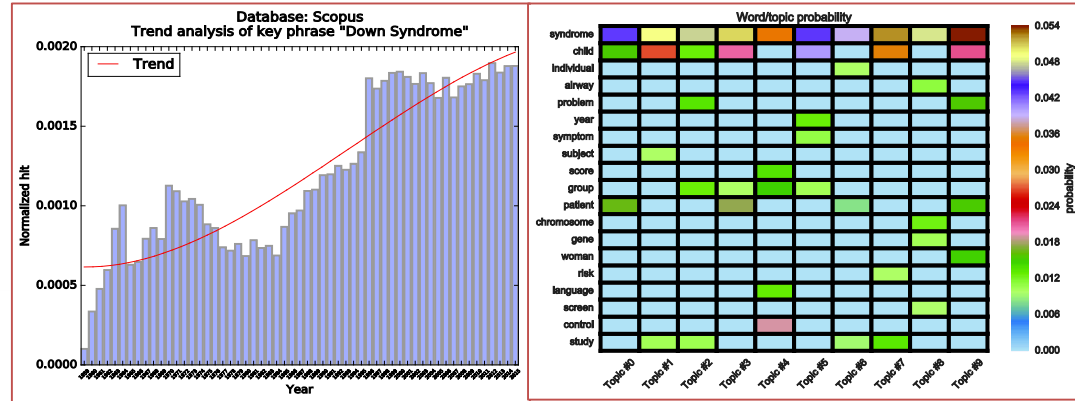


Research Data Services

- High performance workflows for photogrammetry & text analysis



Scalability study of AgiSoft PhotoScan on Karst & commercial cloud



Evolution of "Downs Syndrome" in Science Direct and Scopus publications since 1980 (w/ Dr. Winona Snapp-Childs)

Research Data Services

- More information
 - rtrds@iu.edu
 - Search the KB (kb.iu.edu)
 - “RDC” or “research database complex”



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Advanced Visualization Lab

- Team members & expertise
 - Mike Boyles – Manager, SciVis, Vis workflows
 - Chris Eller – vis systems, esp. IQ-Walls
 - Bill Sherman – virtual reality & immersive visualization
 - David Reagan – scientific and information visualization
 - Jeff Rogers – 3D digitization, CAD and SciVis workflows
 - Chauncey Frend – augmented and virtual reality
 - Ed Dambik – Creative applications



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Advanced Visualization Lab

- Services
 - Displays – IQ-Walls & Tables, Reality Labs, Flagship Facilities
 - Consulting – Scientific Visualization, Information Visualization, Virtual & Augmented Reality
 - Data Acquisition – 3D Scanning, Advanced Media, Photogrammetry



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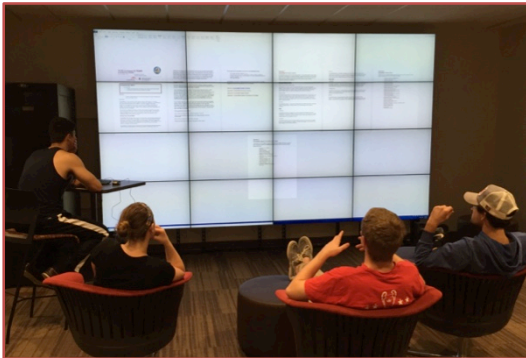
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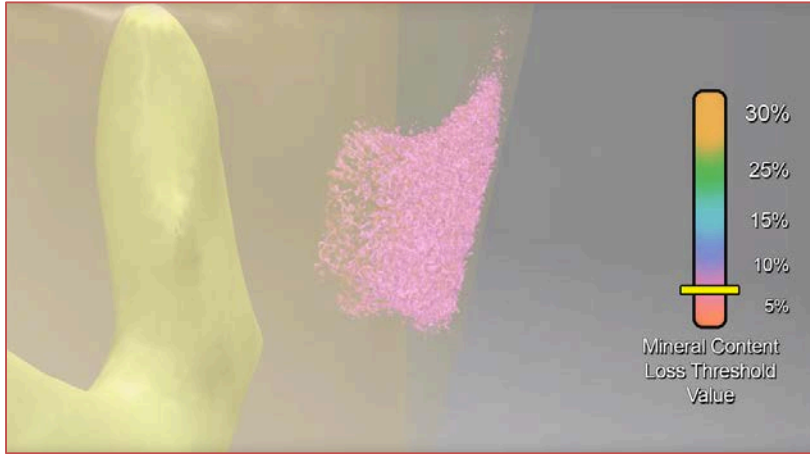
AVL Displays

A&H Workshops – Feb 2 (AR), Feb 16 (VR), Apr. 6 (IQ-Systems)



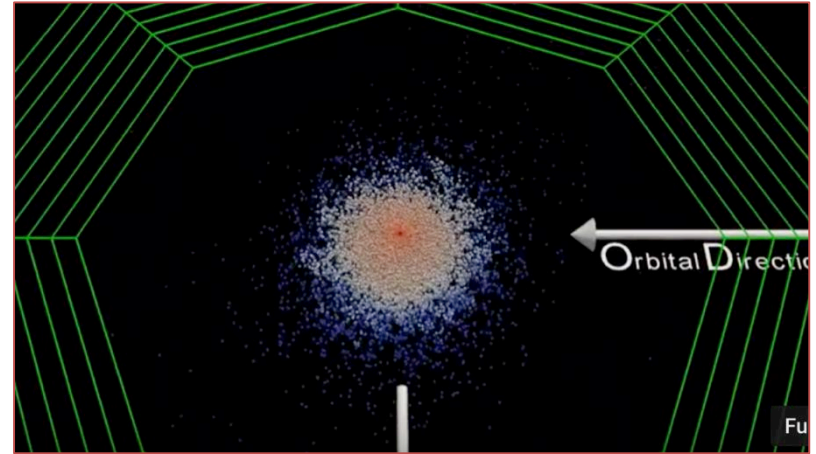
SciVis with Paraview

(DAV Workshop: Mar. 6)



Dr. Masatoshi Ando
School of Dentistry

3D analysis of demineralization and
restoration of caries lesions

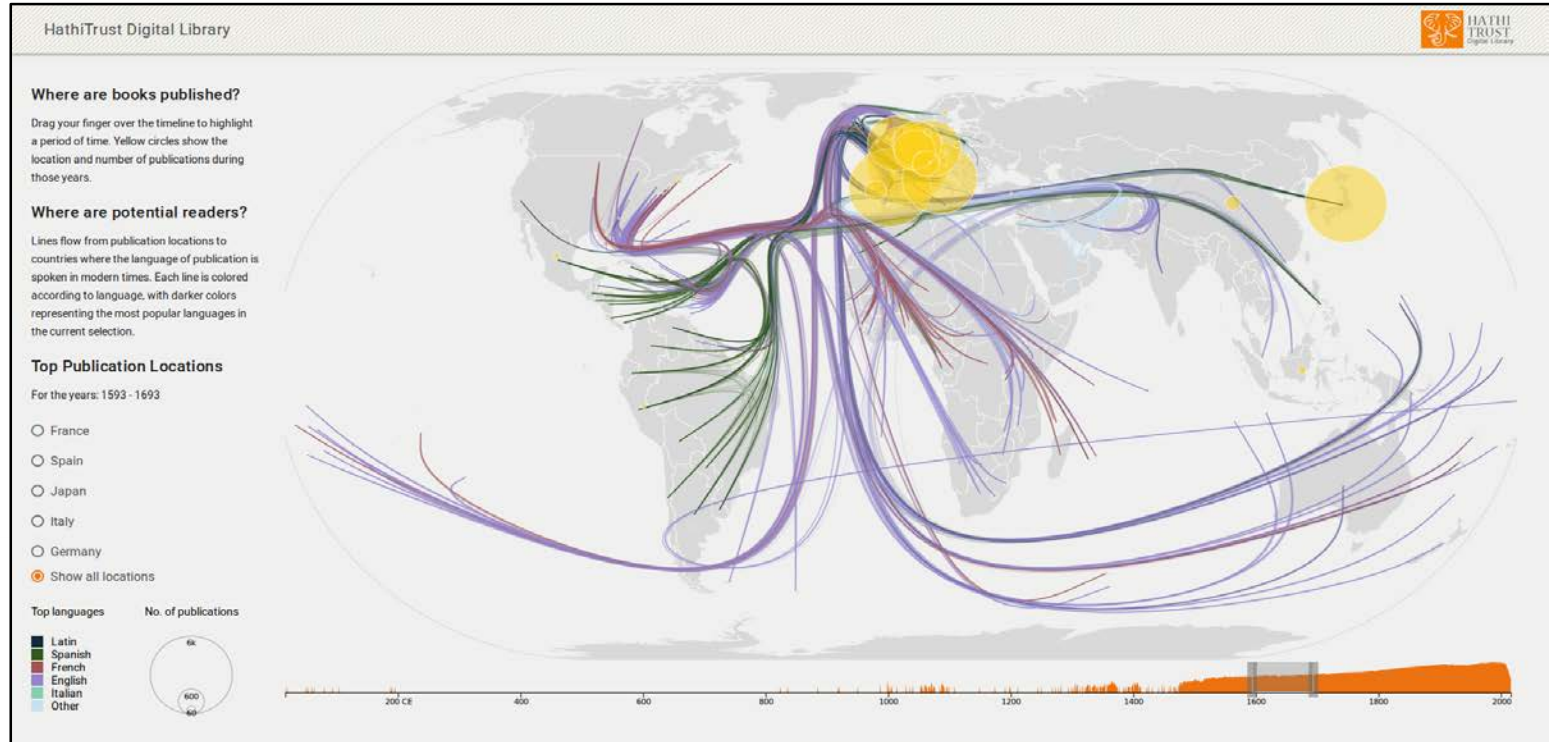


Dr. Enrico Vesperini
Astronomy

HPC simulation of evolution of globular star
clusters

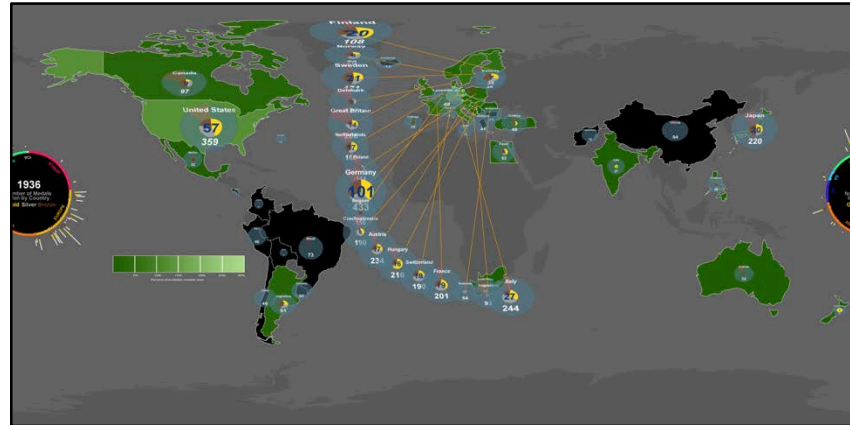
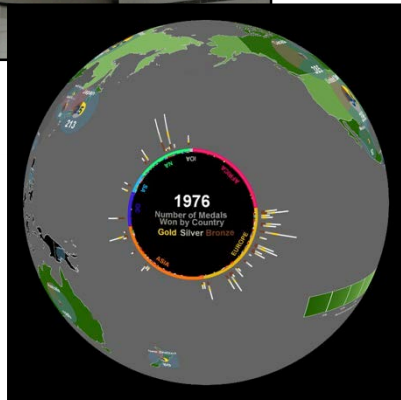
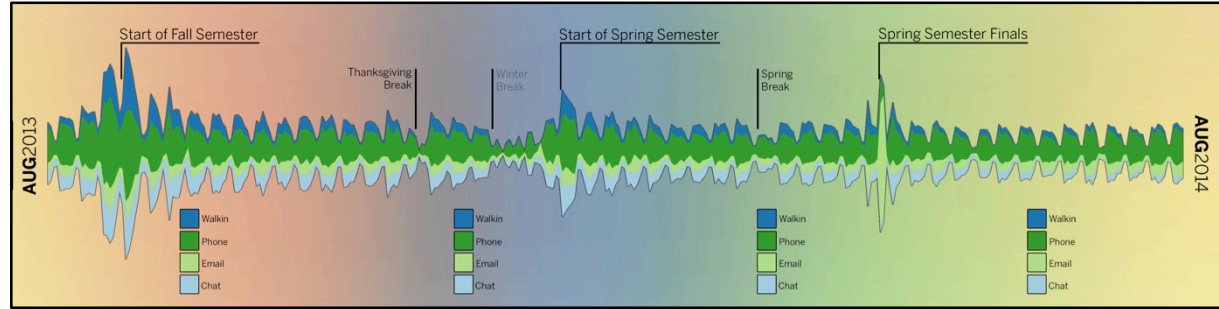
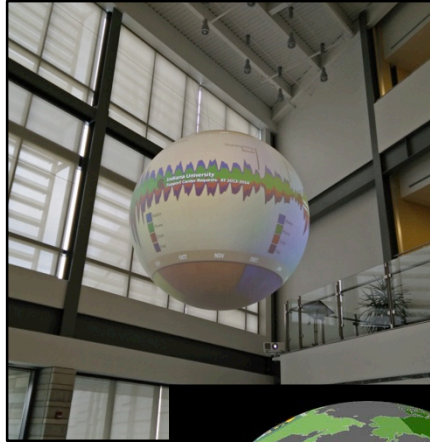
InfoVis: HathiTrust Macroscopic

(DAV Workshop: April 10)



InfoVis: Science on a Sphere

(DAV Workshop: April 10)



AVL – 3D scanning & printing

(A&H Workshop – Mar 30)

- Ruth Lilly Medical Library
 - Historical medical devices from 1687 – onward



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Advanced Visualization Lab

- More information
 - vishelp@iu.edu
 - Search the KB for
 - “visualization”, “AVL”, etc.



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Next week

- “Your Statistical Toolbelt”
 - Stephanie Dickinson
Epidemiology and Biostatistics
IU School of Public Health
 - Tuesday, Feb. 6, noon, SSRC



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Feb 20	Databases, Enclaves, and Repositories for Research	Esen Tuna, Alan Walsh
Feb 27	Analysis with MATLAB	Jefferson Davis, Scott Michael
Mar 6	Intro to Scientific Visualization with Paraview	Bill Sherman, Mike Boyles
Mar 13	(Spring Break)	
Mar 20	Creating Computational Interfaces	Scott Michael, Tassie Gniady
Mar 27	Structural Equation Modeling	Justin Wild
Apr 3	GIS Software & Data Sources for Research	Justin Peters
Apr 10	Intro to Information Visualization	Jefferson Davis, David Reagan

Workshop Recording and Slides

- Available at:
 - <https://ssrc.indiana.edu/seminars/uitsrtworkshops.html>



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